Bb0 B0 C# Db1 D1 Eb1 E1 F1 bb Gb1

12/10 4/30 1/3 4/27 4/25 4/24 (12/7) 1/2 12/6
  6/1 2/0   4/21
  ~~3/1~~
  4/25
  12/9

C0 Db0 D0 Eb0 E0 F0 Gb0 G0 Ab0 A0

Gb-1 G-1 Ab-1 A-1 Db-1 B-1

1/6 (12/16) 15/0 (1/5) 12/13 12/12 1/4 12/11
                                      6/2 (3/2)
1/10 6/4 1/9 12/22 1/8 6/3 3/3   14/0
12/27 12/25 3/4   12/21 12/20 12/19
  12/24

Gb-2 G-2 A-2 A-2 Bb-2 B-2 C-1 Db-1 D-1 Eb-1 E-1 F-1

1/21 1/20 1/19 1/18 1/17 1/16 1/15 1/14 1/13 1/12 15/1 1/11
  6/10 3/10 3/9 15/2 3/8 6/7 3/7   6/5 3/5
    6/9   6/8   12/30
          14/2   14/1

1	0	C	2
1	1	C	2
1	2	F	1
1	3	C	1
1	4	Ab	0
1	5	F	0
1	6	D	0
1	7	C	0
1	8	Bb	-1
1	9	Ab	-1
1	10	Gb	-1
1	11	F	-1
1	12	Eb	-1
1	13	D	-1
1	14	Db	-1
1	15	C	-1
1	16	B	-2
1	17	Bb	-2
1	18	A	-2
1	19	Ab	-2
1	20	G	-2
1	21	Bb	-2
1	22	F	-2
1	23	F	-2
1	24	E	-2
1	25	? Eb	-2
1	26	D-Eb	-2
1	27	D	-2
1	28	Db-D	-2
1	29	Db	-2
1	30	C	+2
1	31	C	-2

6	G	B	1
6	1	B	0
6	2	E	0
6	3	B	-1
6	4	G	-1
6	5	E	-1
6	6	Db?	-1
6	7	B	-2
6	8	A	-2
6	9	G	-2
6	10	G5	-2
6	11	E	-2
6	12	Eb	-2
6	13	D?	-2
6	14	Db?	-2
6	15	B	-3
6	16	Bb	-3
6	17	A	-3
6	18	Ab	-3
6	19	G?	-3
6	20	Gb	-3
6	21	E	-3
6	22	D-E	-3
6	23	D	-3
6	24	Eb?	-3
6	25	Eb	-3
6	26	D?	-3
6	27	Db?	-3

7 = 6 distorted

8 = louder / legato

9 = 6 high

10 = 6

11 = empty

4	3	B	3
4	4	6	3
4	5	G	3
4	6	Db	3
4	7	B	2
4	8	A?	2
4	9	6	2
4	10	F	2
4	11	E?	2
4	12	D	2
4	13	Db	2
4	14	C	2
4	15	B	2
4	16	Bb	2
4	17	A?	2
4	18	Ab	2
4	19	6	2
4	20	Eb	2
4	21	F	2

4	22	E?	1
4	23	Cb?	1
4	24	Eb	1
4	25	D	1
4	26	Db?	1
4	27	Db	1
4	28	C	1
4	29	B0-c1	
4	30	13	0
4	31	Bb-B	0

4=5

reedy

15	0	E	0
15	1	5	-1
15	2	A	-2
15	3	6	-2
15	4	C	-2
15	5	A	-3
15	07	6	-3
15	8	D	-3

2	0	C	1
2	1	C	-2
2	2	F	-3
2	3	C	-3
3	0	C	2
3	1	C	1
3	2	F	0
3	3	C	⓪
3	4	Ab	-1
3	5	E	-1
3	6	D-Eb	-1
3	7	C	-1
3	8	Bb	-2
3	9	Ab	-2
3	10	G	-2
3	11	F	-2
3	12	E	-2
3	13	D	-2
3	14	Db	-2
3	15	C	-2
3	16	B	-3
3	17	Bb	-3
3	18	A	-3
3	19	Ab	-3
3	20	G	-3
3	21	Eb/Gb?	-3
3	22	Gb	-3
3	23	F	-3
3	24	E	-3
3	25	E?	-3
3	26	Eb	-3
3	27	D	-3
3	28	Db	-3
3	29	Db	-3
3	30	Db	-3
3	31	C	-3

14 7 E −3
14 8 C −3

12 1 E 3
12 2 A? 2
12 3 E? 2
12 4 C 2
12 5 A? 1
12 6 Gb 1
12 7 E? 1
12 8 D? 1
12 9 C 1
12 10 Bb 0
12 11 A? 0
12 12 G 0
12 13 Gb 0
12 14 F? 0
12 15 E? 0

12 16 Eb? 0
12 17 D? 0
12 18 C? 0
12 19 C 0
12 20 B −1
12 21 Bb −1
12 22 A −1
12 23 Ab-4 −1
12 24 B −1
12 25 G −1
12 26 Gb-G −1
12 27 G4 −1
12 28 F? −1
12 29 E? −1
12 30 B −1
12 31 E? −1

13=12
14 0 E 0
14 1 E −1
14 2 A −2
14 3 E? −2
14 4 C −3
14 5 A −3
14 6 Gb −3

A = 400

```
0.000   6            64    f =   4    c =  14
0.000   6            64    f =  14    c =   6
0.014   9           517    f =  28    c =   4
0.019              --------
0.039   8           263    f =  18    c =  12
0.061          D
0.063   9           535    f =  27    c =   4
0.065  10          1071    f =  13    c =   4
0.065  11          2142    f =   6    c =   4
0.102              --------
0.109   6            69    f =  13    c =   6
0.109   7           138    f =   6    c =   6
0.114   8           277    f =  17    c =  12
0.116   9           555    f =   8    c =  12
0.116   9           555    f =  26    c =   4
0.144          D# / Eb
0.170   9           576    f =  25    c =   4
0.171  10          1153    f =  12    c =   4
0.186              --------
0.200   8           294    f =  16    c =  12
0.209   6            74    f =  12    c =   6
0.227          E
0.229   9           600    f =  24    c =   4
0.269              --------
0.285   7           156    f =  31    c =  12
0.285   8           312    f =  15    c =  12
0.288   9           625    f =   7    c =  12
0.288   9           625    f =  23    c =   4
0.288  10          1250    f =   3    c =  12
0.288  10          1250    f =  11    c =   4
0.288  11          2500    f =   1    c =  12
0.288  11          2500    f =   5    c =   4
0.288  12          5000    f =   0    c =  12
0.288  12          5000    f =   2    c =   4
0.311          F
0.322   6            80    f =   3    c =  14
0.322   6            80    f =  11    c =   6
0.331   7           161    f =   1    c =  14
0.331   7           161    f =   5    c =   6
0.331   7           161    f =  30    c =  12
0.331   8           322    f =   0    c =  14
0.331   8           322    f =   2    c =   6
0.349   9           652    f =  22    c =   4
0.352              --------
0.375   7           166    f =  29    c =  12
0.379   8           333    f =  14    c =  12
0.394          F# / Gb
0.412   9           681    f =  21    c =   4
0.413  10          1363    f =  10    c =   4
0.426   7           172    f =  28    c =  12
0.436              --------
0.443   6            87    f =  10    c =   6
0.476   7           178    f =  27    c =  12
0.477          G
0.480   8           357    f =  13    c =  12
0.480   9           714    f =   6    c =  12
0.480   9           714    f =  20    c =   4
0.519              --------
0.531   7           185    f =  26    c =  12
0.551   9           750    f =  19    c =   4
0.551  10          1500    f =   9    c =   4
0.551  11          3000    f =   4    c =   4
0.561          G# / Ab
0.585   6            96    f =   9    c =   6
0.585   7           192    f =  25    c =  12
0.585   8           384    f =  12    c =  12
```

```
0.592   7            193   f =  4   c =  6
0.602            --------
0.624   9            789   f = 18   c =  4
0.644         A
0.644   7            200   f = 24   c = 12
0.686            --------
0.700   7            208   f = 23   c = 12
0.700   8            416   f = 11   c = 12
0.702   9            833   f =  5   c = 12
0.702   9            833   f = 17   c =  4
0.702  10           1666   f =  2   c = 12
0.702  10           1666   f =  8   c =  4
0.727         A#  /  Bb
0.741   6            107   f =  2   c = 14
0.741   6            107   f =  8   c =  6
0.762   7            217   f = 22   c = 12
0.769            --------
0.785   9            882   f = 16   c =  4
0.807   5             56   f = 16   c =  6
0.811         B
0.827   7            227   f = 21   c = 12
0.827   8            454   f = 10   c = 12
0.852            --------
0.870   8            468   f = 31   c =  4
0.872   9            937   f = 15   c =  4
0.873  10           1875   f =  7   c =  4
0.873  11           3750   f =  3   c =  4
0.873  12           7500   f =  1   c =  4
0.873  13          15000   f =  0   c =  4
0.894         C
0.895   7            238   f = 20   c = 12
0.907   5             60   f = 15   c =  6
0.907   6            120   f =  7   c =  6
0.913   7            241   f =  3   c =  6
0.916   8            483   f =  1   c =  6
0.916   8            483   f = 30   c =  4
0.917   9            967   f =  0   c =  6
0.936            --------
0.966   7            250   f = 19   c = 12
0.966   8            500   f =  9   c = 12
0.966   8            500   f = 29   c =  4
0.966   9           1000   f =  4   c = 12
0.966   9           1000   f = 14   c =  4
0.977         C#  /  Db
```

```
0.000   6           64   f  =   4   c  =  14
0.000   6           64   f  =  14   c  =   6
0.014   9          517   f  =  28   c  =   4
0.031       C
0.039   8          263   f  =  18   c  =  12
0.063   9          535   f  =  27   c  =   4
0.065  10         1071   f  =  13   c  =   4
0.065  11         2142   f  =   6   c  =   4
0.073       --------
0.109   6           69   f  =  13   c  =   6
0.109   7          138   f  =   6   c  =   6
0.114   8          277   f  =  17   c  =  12
0.115       C# / Db
0.116   9          555   f  =   8   c  =  12
0.116   9          555   f  =  26   c  =   4
0.156       --------
0.170   9          576   f  =  25   c  =   4
0.171  10         1153   f  =  12   c  =   4
0.198       D
0.200   8          294   f  =  16   c  =  12
0.209   6           74   f  =  12   c  =   6
0.229   9          600   f  =  24   c  =   4
0.240       --------
0.281       D# / Eb
0.285   7          156   f  =  31   c  =  12
0.285   8          312   f  =  15   c  =  12
0.288   9          625   f  =   7   c  =  12
0.288   9          625   f  =  23   c  =   4
0.288  10         1250   f  =   3   c  =  12
0.288  10         1250   f  =  11   c  =   4
0.288  11         2500   f  =   1   c  =  12
0.288  11         2500   f  =   5   c  =   4
0.288  12         5000   f  =   0   c  =  12
0.288  12         5000   f  =   2   c  =   4
0.322   6           80   f  =   3   c  =  14
0.322   6           80   f  =  11   c  =   6
0.323       --------
0.331   7          161   f  =   1   c  =  14
0.331   7          161   f  =   5   c  =   6
0.331   7          161   f  =  30   c  =  12
0.331   8          322   f  =   0   c  =  14
0.331   8          322   f  =   2   c  =   6
0.349   9          652   f  =  22   c  =   4
0.365       E
0.375   7          166   f  =  29   c  =  12
0.379   8          333   f  =  14   c  =  12
0.406       --------
0.412   9          681   f  =  21   c  =   4
0.413  10         1363   f  =  10   c  =   4
0.426   7          172   f  =  28   c  =  12
0.443   6           87   f  =  10   c  =   6
0.448       F
0.476   7          178   f  =  27   c  =  12
0.480   8          357   f  =  13   c  =  12
0.480   9          714   f  =   6   c  =  12
0.480   9          714   f  =  20   c  =   4
0.490       --------
0.531       F# / Gb
0.531   7          185   f  =  26   c  =  12
0.551   9          750   f  =  19   c  =   4
0.551  10         1500   f  =   9   c  =   4
0.551  11         3000   f  =   4   c  =   4
0.573       --------
0.585   6           96   f  =   9   c  =   6
0.585   7          192   f  =  25   c  =  12
0.585   8          384   f  =  12   c  =  12
```

A = 440

```
0.592    7           193   f =  4   c =  6
0.615          G
0.624    9           789   f = 18   c =  4
0.644    7           200   f = 24   c = 12
0.656          --------
0.698          G# / Ab
0.700    7           208   f = 23   c = 12
0.700    8           416   f = 11   c = 12
0.702    9           833   f =  5   c = 12
0.702    9           833   f = 17   c =  4
0.702   10          1666   f =  2   c = 12
0.702   10          1666   f =  8   c =  4
0.740          --------
0.741    6           107   f =  2   c = 14
0.741    6           107   f =  8   c =  6
0.762    7           217   f = 22   c = 12
0.781          A
0.785    9           882   f = 16   c =  4
0.807    5            56   f = 16   c =  6
0.823          --------
0.827    7           227   f = 21   c = 12
0.827    8           454   f = 10   c = 12
0.865          A# / Bb
0.870    8           468   f = 31   c =  4
0.872    9           937   f = 15   c =  4
0.873   10          1875   f =  7   c =  4
0.873   11          3750   f =  3   c =  4
0.873   12          7500   f =  1   c =  4
0.873   13         15000   f =  0   c =  4
0.895    7           238   f = 20   c = 12
0.906          --------
0.907    5            60   f = 15   c =  6
0.907    6           120   f =  7   c =  6
0.913    7           241   f =  3   c =  6
0.916    8           483   f =  1   c =  6
0.916    8           483   f = 30   c =  4
0.917    9           967   f =  0   c =  6
0.948          B
0.966    7           250   f = 19   c = 12
0.966    8           500   f =  9   c = 12
0.966    8           500   f = 29   c =  4
0.966    9          1000   f =  4   c = 12
0.966    9          1000   f = 14   c =  4
0.990          --------
```

<!--X-Subject: [stella] PRECISE 2600 sound chart -->
<!--X-From: Glenn Saunders <krishna@primenet.com> -->
<!--X-Date: Wed, 2 Apr 1997 03:24:33 -0800 (PST) -->
<!--X-Message-Id: Pine.BSI.3.95.970402031943.20971B-100000@usr02.primenet.com -->
<!--X-ContentType: text/plain -->
<!--X-Head-End-->
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<HEAD>
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<LINK REV="made" HREF="mailto:krishna@primenet.com">
</HEAD>
<BODY bgcolor="#ccffff">
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<!--X-User-Header-->
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<HR>
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<UL>
<LI>To: <A HREF="mailto:stella@biglist.com">stella@biglist.com</A></LI>
<LI>Subject: [stella] PRECISE 2600 sound chart</LI>
<LI>From: Glenn Saunders <<A HREF="mailto:krishna@primenet.com">krishna@pr
<LI>Date: Wed, 2 Apr 1997 03:24:33 -0800 (PST)</LI>
<LI>Sender: <A HREF="mailto:owner-stella@biglist.com">owner-stella@biglist.co
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<!--X-Body-of-Message-->
<PRE>

```
-----------------------------------------------------------------------
------------------------ATARI 2600 VCS PRECISE SOUND VALUES------------------
--------------------------AND DISTORTION BREAKDOWN--------------------------
-----------------------------------------------------------------------
---------------------------BY GLENN SAUNDERS---------------------------
---------------------------LAST REVISION  4/2/97---------------------------
-----------------------------------------------------------------------
```

The Atari 2600 (and the Atari 8-bit) produces tones based on polynomial
counters. Because of this, a great many of the notes are "out of tune"
(although it's a lot worse on the 2600 than the 8-bit, which is why 7800
Ballblazer has POKEY on board, for instance.) N ot only that, but there
are some intervals between notes in all of the distortions at the upper-
register which will make slim pickings up there, and some of the notes are
spread between two different distortions like a jigsaw puzzle. These
charts were created for programmers to consult so that they can compose
music that only uses notes that are in tune. To my ears, this means no
more than 10 "cents" off perfect pitch (relative to other notes).

One important thing I have to add is octave values, but I don't have a
keyboard and no way of knowing what "C1" is so this will have to wait
unless someone else would like to revise it.

The process by which music can be composed is tricky. It will require you
to build additional charts off this one that group notes based on how "in
tune" they are in relation to eachother. For instance, you could sort
out all the notes that are between +40 and +50 cents out of tune. Then
you will figure out which group of notes provides you with the largest
variety of notes. Then you will attempt to take your standard notation

and transpose it as best you can to conform it to the available notes
without resulting in "unattainable" notes. The only analogy I can think
of is a DULCIMER, which is fretted so that only the major diatonic scale
can be played, which limits you to only one key. You can't play a
chromatic scale with a dulcimer, and you aren't likely to be able to play
many well-tempered notes close to eachother on the 2600 either.

Another thing that makes it tricky is the crossover between X# -50 and X
+50. Just be aware that the two notes in this example are VERY close in
pitch when sorting and building new charts. If you do build a chart that
crosses over like this, you'll probably have to convert one to the other
in order to make workable music.

Music that will translate well to the 2600 will probably use lots of
octaves and fifths, since there are plenty of those (in tune) in all
pitches.

REVISION HISTORY

4-1-97 First revision. There is a good chance some of the notes may be off due
       to the chromatic tuner returning the value of overtones and not the
       fundemental. I did the best I could with it. There is some room for
       improvement as well as picking some more notes out of the bassy "rumble"
       areas.

--Glenn Saunders <krishna@primenet.com>

CHART KEY---

COLUMNS=Distortion value (decimal) and variation from perfect pitch in CENTs.
        Values containing ? = unknown. Values qualified with an additional ?
        means best-guess.

ROWS=Note values (decimal).

==========================THE 2600 NOTE CHART==================================

NOTE	1	1 CENT	2	2 CENT	3	3 CENT
00	C	-5	C#	-50	C#	-50
01	C	-5	C#	-50?	C#	-50?
02	F	-5	F#	-50?	F#	-50?
03	C	0	C#	-50?	C#	-50?
04	G#	+11	B	-50?	B	-50?
05	F	-5	D#	?	D#	?
06	D	+30	C#	-50?	C#	-50?
07	C	0	B?	?	B	?
08	A#	-8	C#	-50?	C#	-50?
09	G#	+10	MED RUMBLE		G#	+40?
10	F#	+50	RUMBLE		G	0?
11	F	-5	RUMBLE		F	0?
12	E	-50	RUMBLE		E	-40?
13	D	+30	RUMBLE		D	+30?
14	C#	+10	RUMBLE		C#	+50?
15	C	0	RUMBLE		C#	-50?
16	B	-10	RUMBLE		B	+25?
17	A#	-10	RUMBLE		A#	+10?
18	A	0	RUMBLE		A	+30
19	G#	+10	RUMBLE		G#	+40
20	G	+30	RUMBLE		G	+50
21	F#	+50	RUMBLE		G	-20
22	F#	-30	RUMBLE		F#	0
23	F	-5	RUMBLE		F	+20?

24	E	+30	RUMBLE		F		−50?
25	E	−50	RUMBLE		E		−30?
26	D#	−10	RUMBLE		D#		−20?
27	D	+35	RUMBLE		D		+30
28	D	−32	RUMBLE		D		0?
29	C#	+10	RUMBLE		C#		0?
30	C#	−50	LOW RUMBLE		C#		−30?
31	C1?	0	C#?	−50?	C#		−50?

NOTE	4 AND 5	4&5 CENTS	6 AND 10	6&10 CENTS	7 AND 9	8
00	SILENT		B	+40	SAME AS 6	WHITE NOISE
01	B	?	B	+40	DIFF DIST	HIGH
02	E	?	E	+40		HIGH
03	B	?	B	+40		HIGH
04	G	?	G#	−50		HIGH
05	E	?	E	+40		HIGH
06	C#	?	D	−30		HIGH
07	B	?	B	+40		HIGH
08	A	?	A	+40		HIGH
09	G	?	G#	+40		HIGH
10	F	+50	F#	−10		MED
11	E	−20	E	+40		MED
12	D	0	D#	0?		MED
13	C#	+20	D	−40		MED
14	C	−5	C#	−40?		MED
15	B	−15	B	+40?		MED
16	A#	−20	A#	+50?		MED
17	A	−20	A	+50?		MED
18	G#	−15	G#	+50		MED
19	G	0	G#	−50?		LOW
20	F#	+15	G	−40?		LOW
21	F	+40	F#	−20?		LOW
22	F	−50	F	0?		LOW
23	E	−20	E	+30		LOW
24	D#	+15	E	−50?		LOW
25	D	+50	D#	−20?		LOW
26	D	−20	D	+30?		LOW
27	C#	+20	D	0?		LOW
28	C#	−50	C#	+30		LOW
29	C	0	C#	−20?		LOW
30	B	+50	B	0?		LOW
31	B	−15	B	+40		LOW

NOTE	12 AND 13	12&13 CNTS	14	14 CENT	15
00	A	−20?	E	+40	SAME AS 14
01	E	−40?	E	+40	DIFF DIST
02	A	−20	A	+40	
03	E	−10?	E	+40	
04	C	0?	C#	−50	
05	A	−40	A	+40	
06	F#	+10	G	−50?	
07	E	−20	E	+40	
08	D	−20	D	+50?	
09	C	0	C#	−50	
10	A#	+30	B	0?	
11	A	−20	A	0?	
12	G	+50	G#	0?	
13	F#	+20	G	−20	
14	F	0?	F	+20?	
15	E	−20	MED BUZZ		
16	D#	−20	BUZZ		
17	D	−20	BUZZ		

```
18          C#          -15         BUZZ
19          C           0           BUZZ
20          B           +15         BUZZ
21          A#          +32         BUZZ
22          A#          -50         BUZZ
23          A           -20         BUZZ
24          G#          +10         BUZZ
25          G           +50         BUZZ
26          G           -25         BUZZ
27          F#          +15         BUZZ
28          F#          -50         BUZZ
29          F           0           BUZZ
30          E           +50         BUZZ
31          E           -20         LOW BUZZ


ATARI 2600 VCS DISTORTION DESCRIPTIONS (XX &amp; YY = exactly the same notes&amp;dist.
-----------------------------------------


DECIMAL
DISTORTION
VALUE               WHAT IT SOUNDS LIKE
----------          --------------------
00 &amp; 11         TOTALLY SILENT
01                  Buzzy tones
02                  Carries distortion 1 downward into a rumble.
03                  Flangy wavering tones, like a UFO
04 &amp; 05             Pure tones
06 &amp; 10             Inbetween pure tone and buzzy tones (Adventure death uses this
                        Maybe filters off the highs here
07 &amp; 09             Reedy tones, much brighter, down to Enduro car rumble
08                  White noise/explosions/lightning, jet/spacecraft engine
12 &amp; 13             Pure tones, goes much lower in pitch than 04 &amp; 05.
14                  Electronic tones, mostly lows, extends to rumble.
15                  Electronic tones, mostly highs, extends to rumble.


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Archives available at <A HREF="http://www.biglist.com/lists/stella/archives/">http://w
E-mail UNSUBSCRIBE in the body to stella-request@biglist.com to be removed.

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<!--X-Follow-Ups-->
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<UL>
<LI><EM>From</EM>: Nick S Bensema &lt;nickb@primenet.com&gt;</LI>
</UL>
</UL>
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<!--X-References-->
<!--X-References-End-->
<!--X-BotPNI-->
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<UL>
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<STRONG><A HREF="msg00005.html">Re: [stella] sound frequencies</A></STRONG>
</LI>
<LI>Next by Date:
<STRONG><A HREF="msg00007.html">Re: [stella] sound frequencies</A></STRONG>
</LI>
<LI>Prev by thread:
<STRONG><A HREF="msg00007.html">Re: [stella] sound frequencies</A></STRONG>
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